

What is claimed is:

1. A lithium secondary battery, comprising:

a battery case;

an internal electrode body contained in the battery case and including a
5 positive electrode, a negative electrode, and a separator made of porous polymer, the
positive electrode and the negative electrode being wound through the separator so
that the positive electrode and the negative electrode are not brought into direct
contact with each other;

an organic electrolyte contained in the battery case; and

10 a pressure release mechanism disposed at each of both end portions of the
battery case in a winding direction of the positive electrode and the negative
electrode.

2. A lithium secondary battery according to claim 1, wherein the battery case is
15 cylinder-shaped.

3. A lithium secondary battery according to claim 1, wherein at least one of said
pressure release mechanism is disposed at each of both end portions of the battery
case.

4. A lithium secondary battery, comprising:

20 a battery case;

an internal electrode body contained in the battery case and including a
positive electrode, a negative electrode, and a separator made of porous polymer, the
positive electrode and the negative electrode being laminated through the separator

so that the positive electrode and the negative electrode are not brought into direct contact with each other;

an organic electrolyte contained in the battery case; and

at least one pressure release mechanism disposed on a side surface,
5 perpendicular to flat surfaces of said positive electrode and said negative electrode,
of the battery case.

10 5. A lithium secondary battery according to claim 4, wherein said pressure
release mechanism is disposed on each of at least one pair of facing side surfaces of
the battery case.

6. A lithium secondary battery according to claim 1, wherein when battery
capacity is C (Ah) and the total area of opening portions where the pressure release
mechanisms operate is S (cm²), the relation of $0.05 \leq S/C \leq 2$ is established.

15 7. A lithium secondary battery according to claim 4, wherein when battery
capacity is C (Ah) and the total area of opening portions where the pressure release
mechanisms operate is S (cm²), the relation of $0.05 \leq S/C \leq 2$ is established.

8. A lithium secondary battery according to claim 1, wherein an operational
pressure of the pressure release mechanism is 2 to 10 kg/cm².

20 9. A lithium secondary battery according to claim 4, wherein an operational
pressure of the pressure release mechanism is 2 to 10 kg/cm².

10. A lithium secondary battery according to claim 1, wherein a difference in operational pressures of the installed pressure release mechanisms is 8 kg/cm^2 or less.

11. A lithium secondary battery according to claim 4, wherein a difference in operational pressures of the installed pressure release mechanisms is 8 kg/cm^2 or less.

12. A lithium secondary battery, comprising:

a battery case;

an internal electrode body contained in the battery case and including a positive electrode, a negative electrode, and a separator made of porous polymer, the positive electrode and the negative electrode being wound through the separator so that the positive electrode and the negative electrode are not brought into direct contact with each other;

an organic electrolyte contained in the battery case; and

at least one pressure release mechanism disposed in one end portion of the battery case in a winding direction of said internal electrode body,

wherein when the total area of an opening portion where the pressure release mechanism operates is $S \text{ (cm}^2\text{)}$ and capacity of the lithium battery is $C \text{ (Ah)}$, the relation of $0.5 \leq S/C \leq 2$ is established.

13. A lithium secondary battery, comprising:

a battery case;

an internal electrode body contained in the battery case and including a positive electrode, a negative electrode, and a separator made of porous polymer, the positive electrode and the negative electrode being laminated through the separator

so that the positive electrode and the negative electrode are not brought into direct contact with each other;

an organic electrolyte contained in the battery case; and

at least one pressure release mechanism disposed on a side surface
5 perpendicular to flat surfaces of said positive electrode and said negative electrode
or on each of at least two of not facing side surfaces, of the battery case,

wherein when the total area of an opening portion where the pressure release mechanism operates is S (cm²) and capacity of the lithium battery is C (Ah), the relation of $0.5 \leq S/C \leq 2$ is established.

10 14. A lithium secondary battery according to claim 1, wherein the pressure release mechanism includes a metal foil which bursts to release an internal pressure of the battery to an outside pressure.

15 15. A lithium secondary battery according to claim 4, wherein the pressure release mechanism includes a metal foil which bursts to release an internal pressure of the battery to an outside pressure.

16. A lithium secondary battery according to claim 12, wherein the pressure release mechanism includes a metal foil which bursts to release an internal pressure of the battery to an outside pressure.

20 17. A lithium secondary battery according to claim 13, wherein the pressure release mechanism includes a metal foil which bursts to release an internal pressure of the battery to an outside pressure.

18. A lithium secondary battery according to claim 1, wherein the pressure release mechanism includes a groove portion disposed in a metal plate, the groove portion being burst so that an internal pressure of the battery is released to an outside pressure.

5 19. A lithium secondary battery according to claim 4, wherein the pressure release mechanism includes a groove portion disposed in a metal plate, the groove portion being burst so that an internal pressure of the battery is released to an outside pressure.

10 20. A lithium secondary battery according to claim 12, wherein the pressure release mechanism includes a groove portion disposed in a metal plate, the groove portion being burst so that an internal pressure of the battery is released to an outside pressure.

15 21. A lithium secondary battery according to claim 13, wherein the pressure release mechanism includes a groove portion disposed in a metal plate, the groove portion being burst so that an internal pressure of the battery is released to an outside pressure.

22. A lithium secondary battery according to claim 14, wherein the metal foil disposed at a positive side is made of aluminum, and the metal foil disposed at a negative side is made of copper or nickel.

20 23. A lithium secondary battery according to claim 15, wherein the metal plate disposed at a positive side is made of aluminum, and the metal plate disposed at a negative side is made of copper or nickel.

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24. A lithium secondary battery according to claim 16, wherein the metal foil disposed at a positive side is made of aluminum, and the metal foil disposed at a negative side is made of copper or nickel.

5 25. A lithium secondary battery according to claim 17, wherein the metal plate disposed at a positive side is made of aluminum, and the metal plate disposed at a negative side is made of copper or nickel.

26. A lithium secondary battery according to claim 18, wherein the metal plate disposed at a positive side is made of aluminum, and the metal plate disposed at a negative side is made of copper or nickel.

10 27. A lithium secondary battery according to claim 19, wherein the metal plate disposed at a positive side is made of aluminum, and the metal plate disposed at a negative side is made of copper or nickel.

15 28. A lithium secondary battery according to claim 20, wherein the metal plate disposed at a positive side is made of aluminum, and the metal plate disposed at a negative side is made of copper or nickel.

29. A lithium secondary battery according to claim 21, wherein the metal plate disposed at a positive side is made of aluminum, and the metal plate disposed at a negative side is made of copper or nickel.

20 30. A lithium secondary battery according to claim 12, wherein an area of an opening of the pressure release mechanism is not less than 0.1 cm^2 .

31. A lithium secondary battery according to claim 13, wherein an area of an opening of the pressure release mechanism is not less than 0.1 cm^2 .

5 32. A lithium secondary battery according to claim 1, wherein battery capacitance is not less than 5 Ah.

33. A lithium secondary battery according to claim 4, wherein battery capacitance is not less than 5 Ah.

34. A lithium secondary battery according to claim 12, wherein battery capacitance is not less than 5 Ah.

10 35. A lithium secondary battery according to claim 13, wherein battery capacitance is not less than 5 Ah.

36. A lithium secondary battery according to claim 1, wherein the battery is used for an electric vehicle or a hybrid electric vehicle.

15 37. A lithium secondary battery according to claim 4, wherein the battery is used for an electric vehicle or a hybrid electric vehicle.

38. A lithium secondary battery according to claim 12, wherein the battery is used for an electric vehicle or a hybrid electric vehicle.

39. A lithium secondary battery according to claim 13, wherein the battery is used for an electric vehicle or a hybrid electric vehicle.